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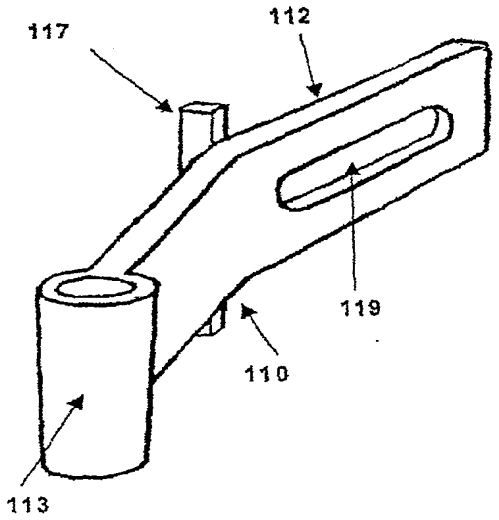
(54) Title: METHODS AND APPARATUS FOR PROVIDING FALL-ARREST PROTECTION



(57) Abstract: A fall-arrest system is designed for convenient attachment and/or removal relative to a support structure. The system includes a safety line and line supporting brackets that cooperate to support and facilitate passage of a coupling device along the safety line. The system also includes base members that are secured to the support structure and adapted for convenient installation and removal of the lien supporting brackets relative thereto. The base members are relatively inexpensive parts that may be left in place on the support structure upon completion of a project, whereas the relatively more expensive line supporting brackets and safety line may be removed for use at other sites.

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METHODS AND APPARATUS FOR PROVIDING FALL-ARREST PROTECTION

Field of the Invention

The present invention relates to methods and apparatus for providing fall-arrest protection, especially fall-arrest systems that may be installed and removed on an intermittent basis.

Background to the Invention

Various occupations place people in precarious positions at relatively dangerous heights, thereby creating a need for fall-arresting safety apparatus. An exemplary situation may be described with reference to towers or pylons that are used for various purposes, including support of transmission lines, telecommunications devices, drilling equipment, etc.

In the absence of a fall-arrest system on the tower, a person wishing to climb the tower must use a pair of lanyards in alternating fashion and "tie off" every six feet or so, as he ascends and descends the tower. This process is both time consuming and tiresome.

Various known fall-arrest systems may be installed on a tower to render it safer and/or move convenient for climbing. For example, a cable may be secured to points along the tower, and a cable grab or other suitable coupling device may be movably mounted on the cable or limit injury to a person in the event of a fall. Such a system is disclosed in US-A-4071926, which is incorporated herein by reference. This system may be modified to allow bypassing of the cable brackets in a manner similar to that shown in US-A-5343975. These systems are suitable for their intended purpose, but installation on a wide scale basis, such as every tower along a utility line, may be

considered cost prohibitive. Another problem is that safety legislation may require that such permanently fitted safety systems be regularly inspected, which creates still further work and expense.

Standard utility towers require attention, such as painting, on a relatively frequent basis. For example, tower maintenance may require one week of intense activity every seven years. During that week, one or more persons will ascend and descend the tower on a regular basis in order to complete the task at hand. However, upon completion of the task, the tower may go unattended for many years. The applicant has thus perceived that a need for a fall-arrest system exists on a short term basis.

Summary of the Inventio

One object of the present invention is to provide a fall-arrest system that may readily installed and removed from a tower, pylon, or other support structure. As used herein the term "tower" means any erect structure, including pylons.

In particular, the invention provides a safety line assembly comprising:

a safety line;

a base member having a first end and a second end, wherein mounting means are provided at the first end, and receiving means defining an orifice are provided at the second end;

a removable member having a first portion for insertion into the receiving means, and a second portion for supporting a portion of the safety line and allow passage of the coupling device along the safety line; and

a latching means for releasably latching the first portion within the orifice, whereby the base member may be permanently installed relative to a support

structure, and the removable member and the safety line may be installed on an as needed basis and thereafter removed.

An advantage of the present invention is that it provides a fall-arrest system that may be readily installed on a tower for use during a period of activity, and then readily removed from the tower during a subsequent period of inactivity. Another advantage of the present invention is that the system can be suitable for retrofit on existing towers.

The line supporting members may be secured to the base members when work on the support structure is to be performed, and then removed from the base members when work on the support structure is finished. Because they are relatively simple parts, the base members can be left in place on the support structure with relatively little associated cost. The relatively more expensive line supporting members and safety line remain available for use on a more regular basis.

Another aspect of the present invention is to provide such a system in a manner that is conducive to retrofit on existing support structures. For example, the base members are preferably configured for mounting on climbing pegs on the type that already exist on various conventional towers and pylons.

Yet another aspect of the present invention is to provide such a system in a self-contained assembly that may be readily stored, transported, and deployed. For example, the line supporting members are preferably threaded onto a safety line, which in turn, is preferably wound about a reel when not in use. In particular, in one aspect the invention provides a ready-to-install safety line assembly, comprising:

a reel;

a safety line wound about the reel, wherein the safety line has a first end, a second end, and an intermediate portion disposed therebetween; and

line supporting assemblies threaded onto the intermediate portion of the safety line.

In a still further aspect, the invention provides a method of installing a fall-arrest system on a tower that is climbed on an intermittent basis, comprising the steps of:

providing a ready-to-install safety line assembly, including a safety line, a plurality of line supporting members, and a plurality of base members;

securing the base members to the tower at respective, vertically spaced locations;

releasably securing the line supporting members to the base members;

securing an upper end of the safety line to an upper portion of the tower;

securing a lower end of the safety line to a lower portion of the tower;

thereafter, using the safety line while ascending and descending the tower to perform a task; and

upon completion of the task, removing the safety line and the line supporting members from the tower, while leaving the base members in place for installation of line supporting members and a safety line at another time in the future.

Additional features and/or advantages of the present invention may become apparent from the more detailed description of an exemplary embodiment of the invention that follows.

Brief Description of the Drawings

With reference to the figures of the drawings, wherein like numerals reference like parts and assemblies throughout the several views.

Figure 1 is a schematic perspective view showing a safety line assembly according to one embodiment of the invention fitted to a tower;

Figure 2 is a schematic view showing a workman ready to climb a tower and fit the safety line assembly to the fixed base members on the tower;

Figure 3 is a perspective view showing one example of a base member to be fixed to the tower;

Figure 4 is a perspective view showing the member of Figure 3 fitted to an upright of the tower;

Figure 5 is a perspective view of one example of a removable member for use in this system of the invention;

Figure 6 is a vertical cross-sectional view showing the coupling of the removable member of Figure 5 to the base member of Figure 3;

Figure 7 is a perspective view of the removable member and the base member connected together and also showing the safety line or cable;

Figure 8 is a perspective view of a top anchor to be fitted at the top of the tower, and to which the end of the safety line or cable can be fitted;

Figure 9 is a perspective view showing the anchor of Figure 8 fitted to the upright of a tower, and with the safety line or cable connected;

Figure 10 is a perspective view of one example of a removable member to be used at the bottom of the tower and in particular a member which can be used to tension the cable;

Figure 11 shows an exploded view of the member of Figure 10, including a base member to which the tensioning member can be fitted.

Detailed Description of the Preferred Embodiment

A fall-arrest system constructed according to the principles of the present invention is designated as 100 in Figure 1. In addition to the pylon or tower 90, the system 100 includes a plurality of base members or support brackets 110 that are configured to be secured to the tower 90, a plurality of removable members or line brackets 130 that are releasably secured to the support brackets 110, and a safety line 150 that is threaded through the line brackets 130.

Recognizing that the base members 110 are relatively simple and inexpensive parts, especially in comparison to the line supporting brackets 130 and the cable 150, an advantage of the subject invention is that the base members 110 may be permanently installed on the tower 90, and the line supporting brackets 130 and the cable 150 may be readily installed on an "as needed" basis. In this regard, Figure 1 also shows the safety line assembly including a reel 185 rotatably mounted on a frame 188 which includes a conductive bush for electrically grounding the cable.

As shown in Figure 2, for climbing a tower already fitted with the permanent support brackets 110, the safety line 150 is wound about the reel 185, and several line supporting brackets 130 are threaded onto the safety line 150 for releasable connection to respective base members 110. Also, a heavy-duty snap hook 190 is secured to a distal end of the safety line 150 for connection of a top anchor 140 of the tower. A belay strap 160 is attached to the workman's harness and to the cable 150 at a point below the lowest line bracket 130. As each line bracket is fitted to the supporting brackets 110 on the tower, the belay strap 160 is reconnected to the cable below the remaining line brackets.

A workman commonly known as the "first man up" may climb the tower 90 with the hook 190 and the brackets 130 in tow. If the tower 90 has not yet been fitted

with the permanent brackets 110, then the brackets 130 should be accompanied by associated base members 110. On the other hand, if base members 110 have already been installed or otherwise provided on the tower 90, then it is no longer necessary for such base members 110 to be carried up the tower 90. In any event, the workman will secure the brackets 130 to the tower 90 and anchor the hook 190 to the upper anchor 140 on the tower 90 to provide a convenient and reliable safety system for subsequent trips up and down the tower 90. The lower end of the cable may be secured to the tower by a tensioning device (described with reference to Figure 10) or other known means. A particular advantage of the described embodiment is that each of the line supporting brackets 130 and the hook 190 can be fitted to the tower 90 one handedly, in a simple action. After all of the brackets and the hook are fitted, and after the safety line is tensioned, the safety line can be used by workmen in the same way as a conventional permanently fitted safety cable would be used. Upon completion of a particular project involving the tower 90, such as painting the tower 90 for example, the "last man up" may remove the hook 90 and the brackets 130 along with the safety line 150, while leaving the base members 110 in place.

With reference to Figure 3, each support bracket or base member 110 may be formed as a rigid metal strip 112 having a tube 113 secured to one end, the tube defining an orifice, and mounting means at the opposite end, for example a hole 119 extending through the end. An intermediate portion of the strip 112 is preferably bent to define an angle of for example one hundred thirty degrees. At this point, a bar 117 may be welded on, to facilitate secure fitting of the bracket 110 to the tower.

As shown in Figure 4, each support bracket 110 is secured to a discrete portion of the tower 90 by means of a bolt 91 and first and second nuts, only outer nut 92 being visible. The bolt 91 and nuts are already present on many existing towers 90, and serve

as climbing pegs that extend outward, in alternating fashion, to the left and right of the tower 90. As a result, a support bracket 110 may be secured to the tower 90 simply by removing the interior nut, removing the bolt 91 from the tower 90, inserting the bolt 91 through the hole 119 in the support bracket 110, and then threading the interior nut back onto the bolt 91. Alternatively, the bolts 91 may be fitted for the first time to the tower 90 at the same time as the brackets 110 are fitted. As already mentioned, the bolts 91 act as steps for the workmen climbing the tower.

As shown in Figure 5, each line supporting bracket or removable member 130 includes a line supporting element 135 that is sized and configured to support the safety line 150, for example by threading of the safety line 150 through a tubular part. The line supporting element 135 is welded or otherwise rigidly secured to an end of a folded steel plate and to another end of the plate is welded, in a parallel orientation, a cylindrical sleeve 143. A toggle member 134 is pivotally mounted within the sleeve 133 for pivoting about an axis extending perpendicular to the sleeve 133. The toggle member can thus pivot in and out of a longitudinal slot 144 in the sleeve, as explained below with reference to Figure 6.

The action of the toggle member 134 may be more clearly understood from a consideration of Figure 6. This Figure is a cross section through a line supporting bracket 130 and a bracket 110, coupled together. In particular, the section is through the line supporting element 135 and the sleeve 133 of the line supporting bracket, the sleeve 133 being slotted into the tube 113 on the permanent bracket 110. The toggle 134 is in the form of a finger which extends along the axis of the sleeve 133 and protrudes from one end thereof. The finger is pivoted on a pin 136 at the upper end of the sleeve. At the opposite end of the toggle 134, there is a rounded nose 137 with a

flared portion 138. The part of the toggle or finger 134 between the flared portion and the pivot pin is narrower, so that a shoulder 139 is formed behind the flared portion.

A leaf spring 148 is fitted within the sleeve 133 to the opposite side of the toggle to the shoulder 139. The leaf spring 148 acts to push the nose portion 137 of the toggle laterally, so that the flared portion and shoulder extend beyond the external circumference of the sleeve 113. The lateral movement of the toggle 134 is limited by a transverse pin 149 in the sleeve 133.

As indicated above, the toggle 134 can be moved inwardly, against the action of spring 148, so that the flared portion 138 is inside of the external circumference of the sleeve 113. Thus, when coupling together the line supporting bracket 130 and the fixed bracket 110, the sleeve 113, with the toggle 134 projecting therefrom, is pushed into the tube 113. The edge of the orifice of the tube 113 acts against the inclined surface of the flared portion 138 to push the toggle member to its inner position, thus allowing the sleeve to pass into the tube 113. When the sleeve 133 is fully positioned within the tube 113, the nose portion 137 of the toggle member emerges from the tube and the spring 148 forces the toggle member 134 to its second, outer position. In particular, the shoulder 139 engages the edge of the tube 113, thus preventing accidental decoupling of the line supporting member 130.

The toggle member 134 cooperates with the tube 113 to create a quick-release latching mechanism. As a result, the line supporting bracket 130 may be readily secured to the support bracket 110 by pushing the end of the sleeve 133 into the tube 113 against the action of the spring 148, thus pushing the member 134 into the sleeve 133 (i.e. to its first, inner orientation). The sleeve 133 and the toggle member 134 can now be inserted fully through the tube 113. After the sleeve is fully inserted into the tube, the spring 148 acts to push the end of the member 134 out of the tube 113 to urge

the member 134 into its second orientation. The bracket 130 is thus temporarily locked into the base member 110. This position is illustrated in Figure 7 which also shows the cable 150 on which the line bracket 130 is threaded.

After all of the line supporting brackets 130 are fitted into the fixed brackets 110 on the tower, the end of the cable 150 is fitted to a top anchor 140 as shown in Figures 8 and 9. The anchor 140 has an aperture 141 to which the hook 190 at the end of the cable 150 can be connected. The anchor also has an elongated aperture 142 for allowing connection of the anchor to the tower by means of a bolt 91, in the same way as the supporting brackets 110 are fitted to the tower. The anchor 140 may have a preformed weakness in the form of a notch 143, so that in the event of a fall partial deformation and/or tearing of the anchor will occur to absorb some of the shock of the fall.

Once all of the line supporting brackets 130 and the hook 190 at the end or the cable 150 have been fitted, the cable should be tensioned to remove slack. Most preferably, this is achieved using a special tensioning bracket 170 as shown in Figure 10. In the preferred embodiment of the invention illustrated in the Figures, this line tensioning bracket 170 replaces the lowest line supporting bracket 130. As indicated in Figure 11, the tensioning bracket 170 can be fitted to the same form of fixed bracket 110 as the line supporting brackets 130 are fitted.

The tensioning bracket 170 includes a sleeve 171 which is to be fitted around the tube 113 of the fixed bracket 110. At the top of the sleeve 171 is fitted a cap 172 with a notch 173. The sleeve 171 is slotted at 174 to receive the plate part 112 of the bracket 110. When the sleeve 171 is placed on the tube 113, the plate engages in slot 173 and the tensioning bracket 170 is turned. This movement moves the cap 172 against the action of a coil spring 175 (shown in Figure 11), so that the plate part 112

can be located in a recess 176 in the sleeve. When the tensioning bracket is moved down so as to locate the plate 112 in this position, the cap 172 is released so that the spring 175 moves the cap back to the illustrated position. The tensioning bracket 170 is effectively locked onto the fixed bracket 110.

To the sleeve 171 of the tensioning bracket 170 is fitted a line supporting element 178. The line supporting element has two parts 178a and 178b, the upper part 178a being fixedly connected to the sleeve 171, whereas the lower part 178b is moveably connected by means of a screw 179. Between the sleeve supporting elements 178a and 178b is fitted a split collet 180. In use, with the cable 150 threaded through the line supporting element 178a and 178b, and through the collet 180, the two parts of the line supporting elements can be drawn together by turning the screw 179, this action in turn compressing the split collet 180 so that it tightly grips the cable 150. The tensioning bracket 170 is operated to clamp the cable after it is pulled from below to remove any slack.

After the necessary work is done to the tower, the line supporting bracket 130 may thereafter be readily removed from the support bracket 110 by pushing the end of the toggle member 134 inwards. With the toggle member 134 in its first orientation, the sleeve 133 can easily be pulled out from the tube 113. Obviously, before the line supporting brackets 130 are removed, the hook 190 will have been removed from the top anchor 140. At the bottom of the tower, the tensioning bracket 170 is removed by twisting the cap 172 to allow the sleeve 171 to be moved to a position wherein the plate part 112 is aligned firstly with the slot 173 of the cap and then with the slot 174 of the sleeve, allowing the bracket 170 to be lifted off the fixed bracket 110.

It will thus be understood that after any work on the tower is completed, the workman or workmen will descend from the tower taking all of the safety equipment

with them except the permanently fitted brackets 110. Such brackets will need little or no maintenance and in particular will not require regular inspection under any safety legislation.

This disclosure references a particular embodiment and specific application of the present invention, with the understanding that numerous modifications, variations, and/or improvements may be applied thereto. Among other things, the particular quick-release mechanism depicted in Figures 5 and 6 may be replaced by other suitable systems, including a "pop-in" system having a spring-biased ball detent, for example. In view of the foregoing, the scope of the present invention should be limited only to the extent of the claims that follow.

CLAIMS

1. A safety line assembly comprising:

a safety line (150);

a base member (110) having a first end and a second end, wherein mounting means (119) are provided at the first end, and receiving means (113) defining an orifice are provided at the second end;

a removable member (130) having a first portion (133) for insertion into the receiving means (113), and a second portion (135) for supporting a portion of the safety line (150) and allow passage of the coupling device along the safety line; and

a latching means (134) for releasably latching the first portion (133) within the orifice, whereby the base member (110) may be permanently installed relative to a support structure (90), and the removable member (130) and the safety line (150) may be installed on an as needed basis and thereafter removed.

2. The safety line assembly of claim 1, wherein a plurality of base members (110), removable members (130) and latching means (134) are provided, the latching means being part of the removable member.

3. The safety line assembly of claim 1 or 2, wherein the said receiving means (113) include a tube which defines the orifice.

4. The safety line assembly of any preceding claim, wherein the mounting means (119) on the base member is formed as an aperture.

5. The safety line assembly of any preceding claim, wherein the latching means (134) includes a spring (148) that biases the latching means to remain latched.

6. The safety line assembly of claim 5, wherein the latching means (134) includes a member that it movable between a first position, in which it can pass through

the space defined by the orifice, and a second position, extending radially outward beyond the space.

7. The safety line assembly of claim 6, wherein the latching member (134) pivots between the first position and the second position.

8. The safety line assembly of claim 6 or 7, wherein the removable member (130) includes a sleeve which is provided with a slot to accommodate pivoting of the latching member (134) between the first position and the second position.

9. The safety line assembly of claim 6, 7 or 8, wherein the spring must be compressed to accommodate movement of the member between the first position and the second position.

10. The safety line assembly of any of claims 5 to 9, wherein the latching member (134) has an inclined nose portion, which in use contacts the wall of the orifice, and a shoulder which in use locates over the end of the receiving means to hold the removable member (130) within the orifice.

11. A safety line assembly according to any preceding claim, including at least one removable member (170) which includes clamping means (178) for clamping the line in a state of tension.

12. The safety line assembly of claim 11, wherein the clamping means is defined by two relatively moveable parts (178, 178b) of the removable member (170).

13. The safety line assembly of claim 12, wherein the said two parts (178a, 178b) can be moved by means of a screw in order to compress a collet through which the safety line (150) is threaded.

14. The safety line assembly of claims 11, 12 or 13, wherein the removeable member (170) is lockable around the exterior of the receiving means (113) of the base member (110).

15. The safety line assembly of claim 15, wherein the removable member (170) has a slot for accommodating a part of the base member (110) and can lock onto the base member by means of a notched cap, acting against the force of a spring.

16. The safety line assembly of any preceding claim, wherein an anchor plate (140) is provided for fitting at the top of the structure, the plate (140) having a preformed point of weakness (143) so that the plate will deform in the event of a fall.

17. The safety line assembly of any preceding claim, further comprising means for coupling a workman to the safety line.

18. A ready-to-install safety line assembly, comprising:

a reel (185);

a safety line (150) wound about the reel, wherein the safety line has a first end, a second end, and an intermediate portion disposed therebetween; and

line supporting assemblies (110, 130) threaded onto the intermediate portion of the safety line.

19. The ready-to-install safety line assembly of claim 18, further comprising a connector (190) secured to a distal end of the safety line (150).

20. The ready-to-install safety line assembly of claim 18 or 19, wherein each of the line supporting assemblies includes a base member (110) having mounting means (119) at a first portion thereof.

21. The ready-to-install safety line assembly of claim 20, wherein each said base member (110) has an orifice (113) provided at a second portion thereof.

22. The ready-to-install safety line assembly of claim 21, wherein each of the line supporting assemblies (110, 130) also includes a removable member (130) that is threaded onto the safety line (150) and can be secured within the orifice (113).

23. The ready-to-install safety line assembly of claim 18 or 19, wherein each of the line supporting assemblies includes a removable member (130) that is threaded onto the safety line (150) and can be releasably connected to a suppoet structure.

24. The ready-to-install safety line assembly of claim 23, wherein each said removable member (130) is releasably connected to a respective base member (110) by means of a quick-release mechanism, whereby the base members (110) may be permanently installed relative to the support structure, and the removable members (130) and the safety line (150) may be readily installed on an as needed basis and thereafter readily removed for use at another location.

25. A method of installing a fall-arrest system on a tower that is climbed on an intermittent basis, comprising the steps of:

providing a ready-to-install safety line assembly, including a safety line (150), a plurality of line supporting members (130), and a plurality of base members (110);

securing the base members (110) to the tower at respective, vertically spaced locations;

releasably securing the line supporting members (130) to the base members (110);

securing an upper end (90) of the safety line to an upper portion (140) of the tower;

securing a lower end of the safety line to a lower portion (170) of the tower;

thereafter, using the safety line while ascending and descending the tower to perform a task; and

upon completion of the task, removing the safety line (150) and the line supporting members (130) from the tower, while leaving the base members (110) in place for installation of line supporting members and a safety line at another time in the future.

26. The method of claim 25, wherein the line supporting members (130) are either pre-threaded on the safety line (150) or the safety line is connected to the supporting members (130) during the installation method.

27. The method of claim 25 or 26, further comprising the subsequent steps of, upon beginning a new task that involves climbing the tower (90), releasably securing the line supporting members (130) to respective base members (110);

connecting the safety line (150) to the line support members (130);

securing an upper end (90) of the safety line (150) to an upper portion of the tower (140);

securing a lower end of the safety line to a lower portion of the tower (170);

thereafter, using the safety line (150) while ascending and descending the tower to perform the new task; and

upon completion of the new task, removing the safety line (150) and the line support members (130) from the tower, while leaving the base members (110) in place for future installation of the line support members and the safety line.

28. The method of claim 26, wherein the subsequent step of connecting the safety line (150) is performed before the step of releasably securing the line supporting members (130).

29. The method of any of claims 25 to 28, wherein the step of securing the base members (110) to the tower at respective, vertically spaced locations involves securing the base members (110) to respective climbing pegs (91) on the tower.

30. The method of any of claims 25 to 29, wherein the step of releasably securing the line supporting members (130) to the base members (110) involves insertion of parts of the line supporting members (130) into orifices (113) on respective base members (110).

31. The method of claim 30, wherein the step of removing the safety line (150) and the line supporting members (130) from the tower (90) involves compressing a spring on respective line supporting members (130) and removing the line supporting members from the orifices (113) on respective base members.

32. The method of claim 30 or 31, wherein the line supporting members (130) are mounted in an orifice in the base members (110), preferably in a tubular member (113) which defines said orifice.

33. The method of any of claims 25 to 32, wherein after fitting of the line supporting members (110) the safety line is tensioned and then clamped by at least one of the supporting members (170), in particular the lowest.

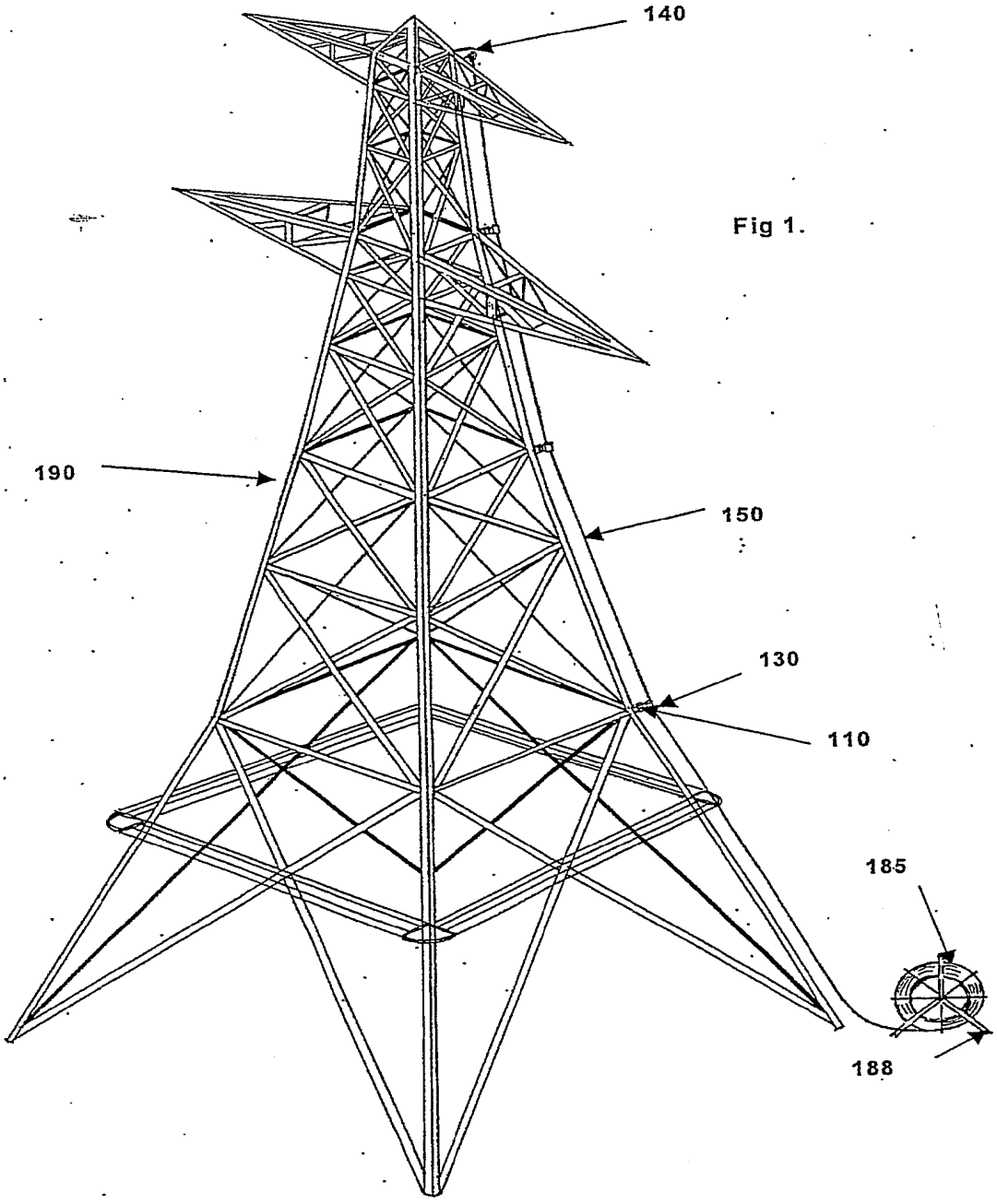
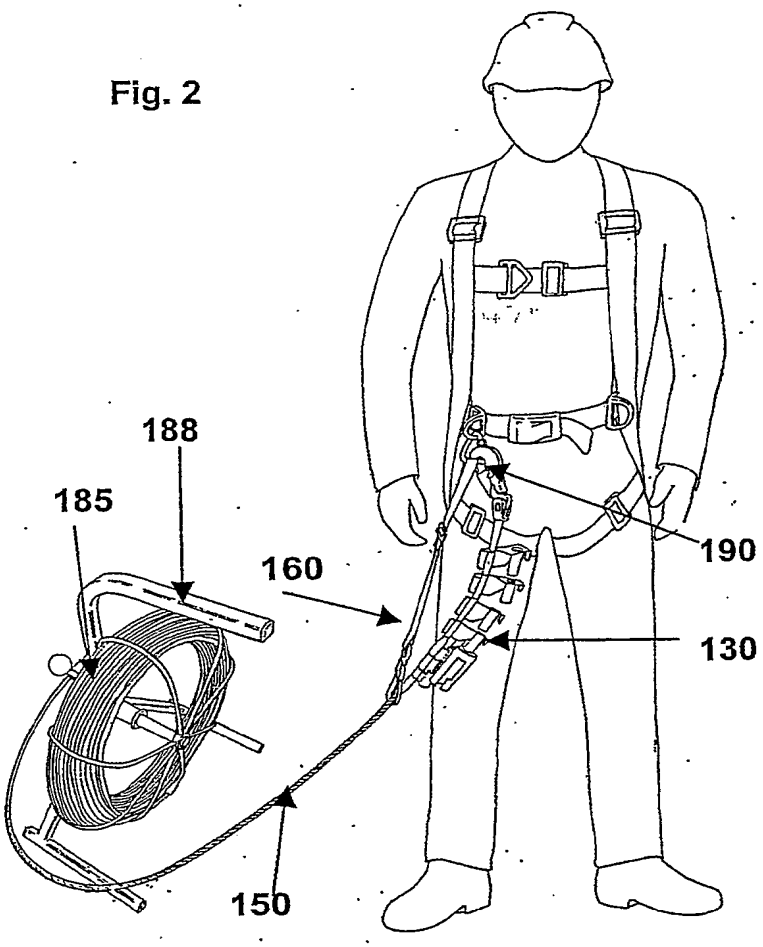


Fig 1.

Fig. 2



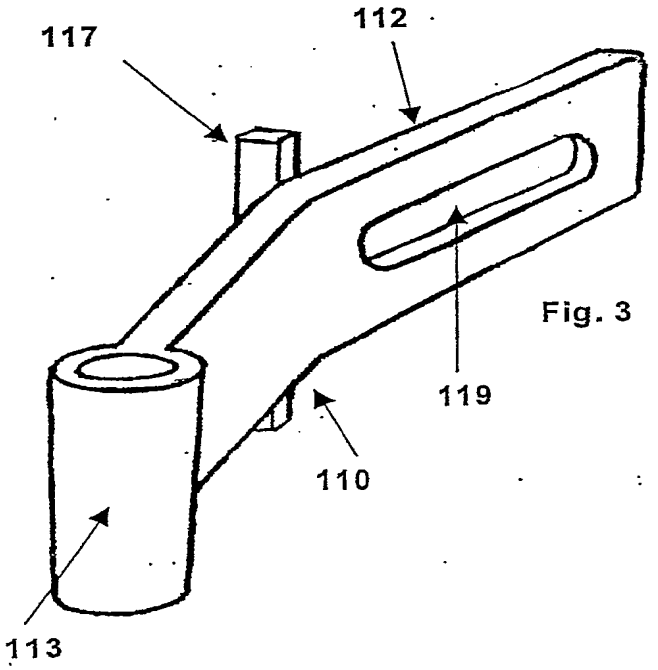


Fig. 3

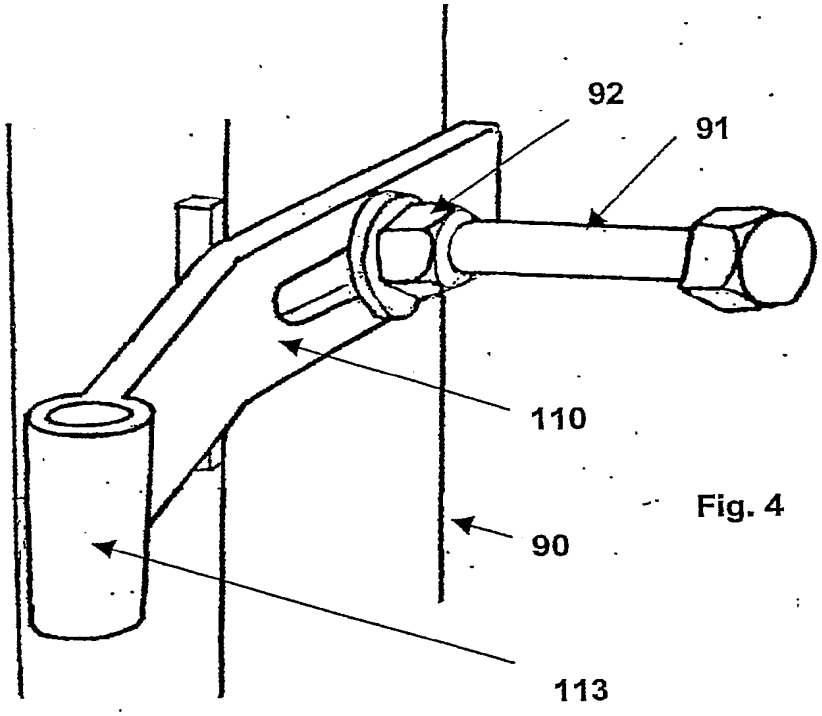


Fig. 4

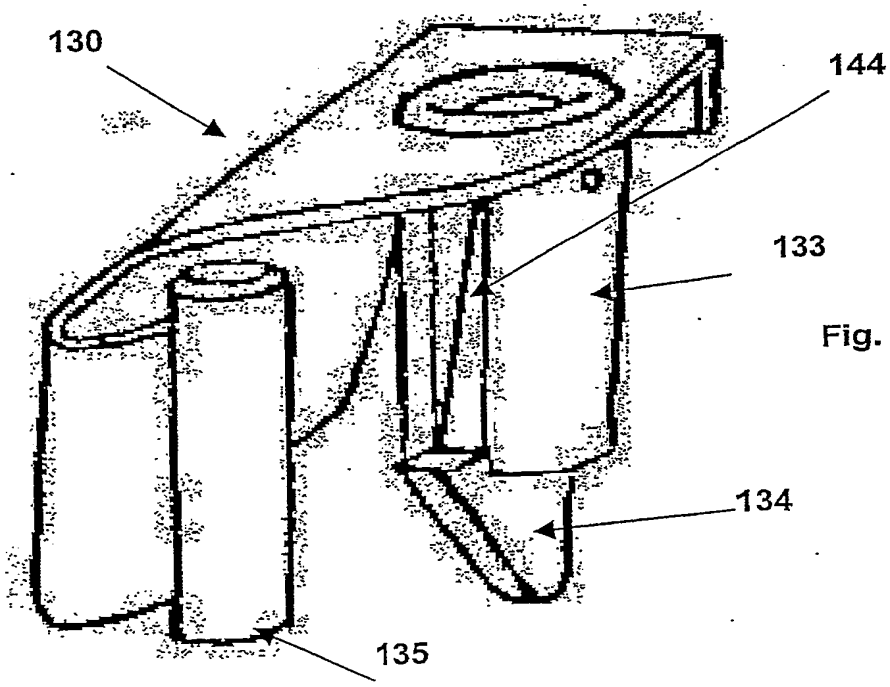


Fig. 5

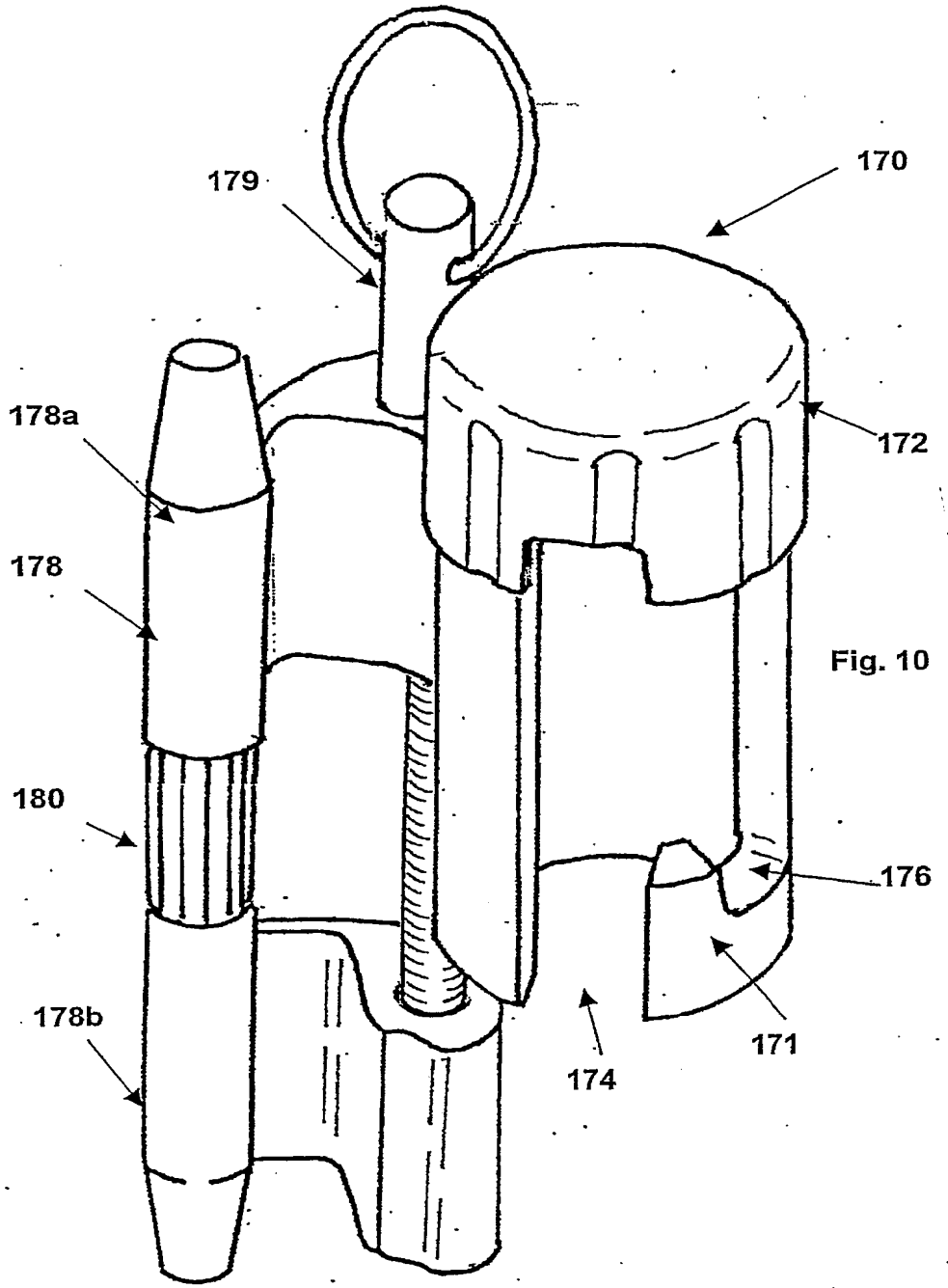


Fig. 10

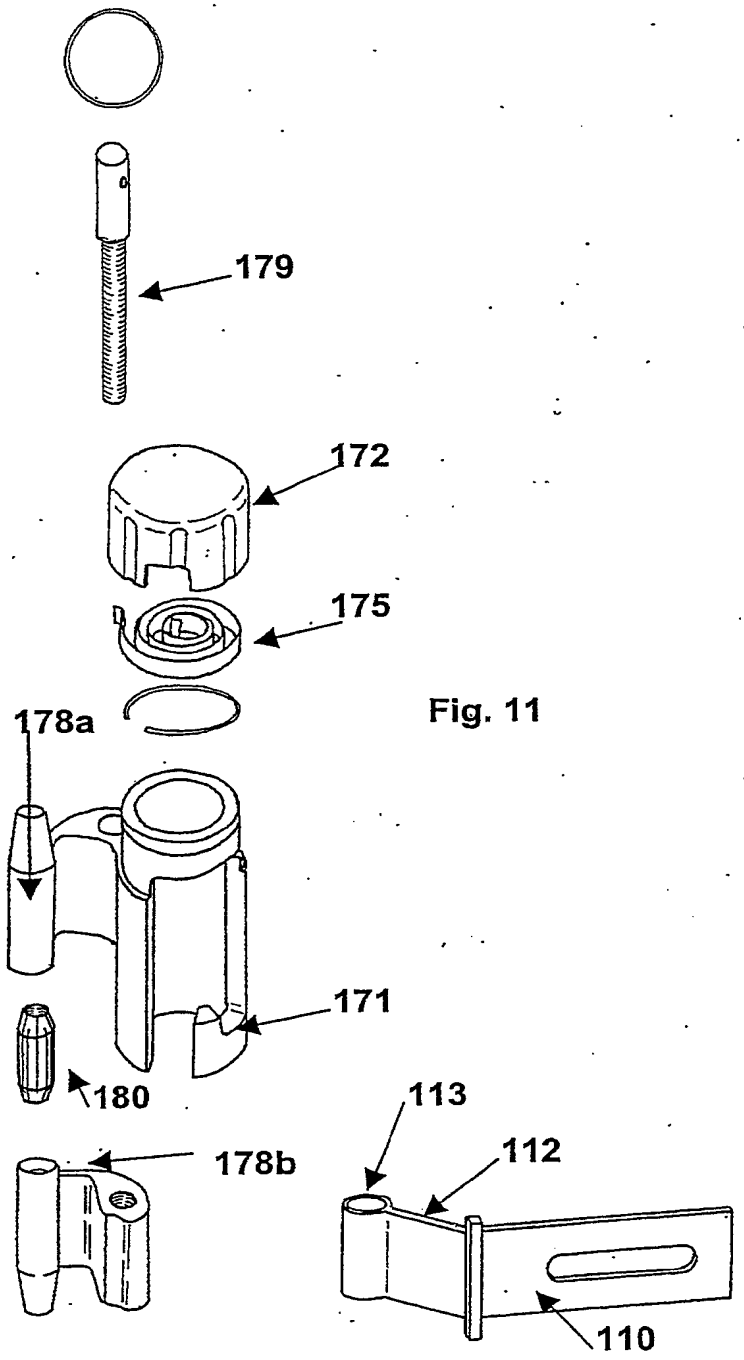


Fig. 11

INTERNATIONAL SEARCH REPORT

PCT/GB 02/05050

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A62B35/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A62B A63B E06C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 296 12 634 U (YUAN CHENG HSIUNG ;YUAN MING SHIEN (TW); CHIOU HSIU HSING (TW)) 12 September 1996 (1996-09-12) figures 9,10	1-33
A	DE 43 12 087 A (GALTIER GUY ;GARROT DENYS (FR)) 14 October 1993 (1993-10-14) abstract; figures 1-4	
A	FR 2 414 926 A (THOMSON CSF) 17 August 1979 (1979-08-17) the whole document	
A	GB 2 346 408 A (LATCHWAYS PLC) 9 August 2000 (2000-08-09) abstract; figures	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 February 2003	26/02/2003

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	van Bilderbeek, H.

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INTERNATIONAL SEARCH REPORT

PCT/GB 02/05050

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 29612634 U	12-09-1996	FR 2750464 A3	02-01-1998
		US 5758742 A	02-06-1998
		DE 29612634 U1	12-09-1996
DE 4312087 A	14-10-1993	FR 2689770 A1	15-10-1993
		DE 4312087 A1	14-10-1993
FR 2414926 A	17-08-1979	FR 2414926 A1	17-08-1979
GB 2346408 A	09-08-2000	AT 203422 T	15-08-2001
		AU 2310800 A	29-08-2000
		CA 2360183 A1	17-08-2000
		DE 60000005 D1	30-08-2001
		DE 60000005 T2	29-05-2002
		EP 1054708 A1	29-11-2000
		ES 2161679 T3	16-12-2001
		WO 0047285 A1	17-08-2000